



Service Description

Lumilinks Predictive Vehicle Maintenance

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Contents

What is Predictive Vehicle Maintenance by Lumilinks?	2
Transformation Pipelines	3
Feature Engineering Pipeline	3
Benefits of Predictive Maintenance by Lumilinks.....	4
Features of Predictive Maintenance by Lumilinks	4
Scheduling:.....	4
Onboarding Call:	4
The Co-Pilots	4
Snowflake Data Warehouse.....	5
Vehicle off road.....	5
Smart Insights	5
Smart Repair	5

What is Predictive Vehicle Maintenance by Lumilinks?

Predictive Vehicle Maintenance by Lumilinks is a tool that enables Fleet Managers, Schedulers and Engineers to proactively maintain and run their fleet using AI driven recommendations. Ingesting data from any number of source systems, it gives users visibility of the fleet metrics that really matter in an easy-to-use and “always-on” system. Further, using Lumilinks’ proprietary AI and Machine Learning models, Predictive Vehicle Maintenance by Lumilinks provides pre-emptive maintenance alerting and best-match repair agent recommendations to ensure that your fleet stays on the road and maximises its value while you operate it.

Predictive Vehicle Maintenance by Lumilinks is source-system agnostic and does not require any hardware to be fitted to your assets, instead it taps in to the rich data that is already generated by your operations, and draws out the value that is already there.

Lumilinks is your trusted partner for the implementation and construction of a state-of-the-art Snowflake data warehouse. In the build phase, we will work closely with your organization to build a robust foundation that empowers Predictive Vehicle Maintenance capabilities. Lumilinks will work with you to deploy Snowflake into a Virtual Private Data warehouse. You can choose between either AWS, Azure or GCP and the region of your choice. (Snowflake exists in most regions however your deployment data engineer will flag if the region you would like is not available)

In parallel to the build of the data warehouse Data Scientists will be exploring and modelling your data in preparation for the Machine Learning models. To enable this they will engage you and key data stakeholders at your business with co-pilot sessions, where you will walk the through your data, your systems, how you use them and any context that might be specific to you and your operations.

In parallel to the build of a data warehouse, Data Scientists at Lumilinks will build transformation, feature engineering and model pipelines for your fleet. These assets are foundational to the Predictive Vehicle Maintenance platform, and require expert curation to set up the bespoke environment for your particular fleet operations.

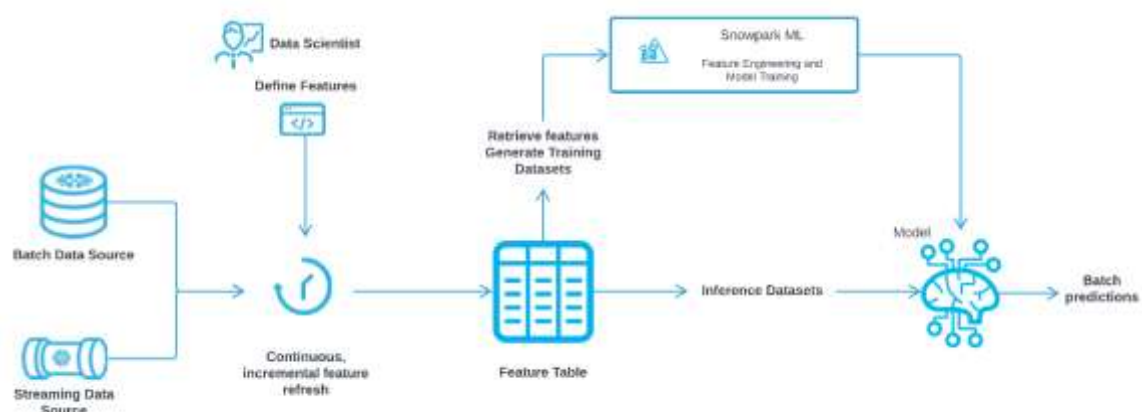


Figure 1 - <https://docs.snowflake.com/en/developer-guide/snowflake-ml/feature-store/overview>

Transformation Pipelines

Data transformation pipelines take data from its source system and format and map it to a data model that is optimised for a certain task. In the case of Predictive Vehicle Maintenance, the data transformation pipelines transform input data sources from different source systems into a standard schema that powers the AI models.

Predictive Vehicle Maintenance by Lumilinks is powered by 4 main data topics, all of which have bespoke transformation processes.

Vehicle data

This data area contains information about the individual assets on fleet. It includes data points such as the registration date of the vehicle and the first on road date, the VIN number of the vehicle, the vehicle manufacturer and model codes.

Depending on your systems this information may exist in your fleet management tool, telematics system or elsewhere, which is why the first step for Predictive Vehicle Maintenance is to transform the data into a standard set of fields.

Repair Data

This data area concerns the service, maintenance and repair (SMR) history of vehicles. This data contains what was fixed or inspected on a vehicle, when and where that took place, and the result of the action. Resulting actions can be replacing parts, repairing parts or simply inspecting the vehicle.

Depending on your systems this information may exist in your fleet management tool, telematics system or elsewhere, which is why the first step for Predictive Vehicle Maintenance is to transform the data into a standard set of fields.

As an optional Predictive Vehicle Maintenance feature, Lumilinks can provide state-of-the-art document AI capability to extract this information from Invoices and work orders, should the data not be digitised already in your SMR operations.

Repair Agent Data

This data area is linked to the SMR history of vehicles, and contains information about where repair and maintenance work was carried out, and how much was charged. Information about the location of the repair agent, and any information about repair networks they operate in is used to power the SmartAgent module.

Telematics Data

Telematics data provides a greater model accuracy when it is present. It concerns the data captured by sensors and hardware on the vehicle that is streamed to a datastore. This is incredibly rich data about the way the vehicle has been operated and driven, how the engine and auxiliary units are performing and data about the emissions from the vehicle. All of these things can be predictive of vehicle failure, particularly when they change in their behaviour.

Feature Engineering Pipeline

Once the data is ingested and transformed into the standard Predictive Vehicle Maintenance Data Schema the data is then modelled into the key features for our predictive models. By default Predictive Vehicle Maintenance utilises Snowflake's feature store.

Generically, *features* are data elements used as inputs to a machine learning model. Many columns in a dataset, such as temperature or mileage, can be used as features as-is. In other cases, a column can be made more useful for training via preprocessing and transformation. For example, you might derive a day-of-week feature from a timestamp to allow the model to detect weekly patterns. Other common feature transformations involve aggregating, differentiating, or time-shifting data. *Feature engineering* is the process of deciding what features are needed by the models and defining how they will be derived from the raw data.

For Predictive Vehicle Maintenance those features include:

1. Week-over-week and month-over-month variability in key metrics and sensor values, including emissions and engine usage.
2. Cross fleet correlation and labelling of assets to identify vehicles that behave similarly and can provide insight into each other
3. Vehicle usage, including age, mileage and engine hours, as well as the type and intensity of that usage.
4. Key indicators in the historic repair profile, identifying any recurring issues or marker events that point to something more sinister
5. Time since and completeness of historic maintenance schedule

Benefits of Predictive Maintenance by Lumilinks

1. Reduce Vehicle off road time : Pre-emptively fixing problems before they occur in vehicles has the impact of reducing vehicle off road time, maximising the value from each asset
2. Smarter planning : Having visibility of likely failures before they happen allows for smart scheduling, forecasting and planning
3. Lower repair spend : Fixing small problems before they become bigger problems results in a lower total net spend on repairs
4. Comprehensive fleet reporting : As part of the process, Lumilinks provides comprehensive oversight of the data used in predictive models which amounts to comprehensive historic and live fleet reporting, available and speed to key stakeholders
5. Better procurement : Diagnosing systemic problems in particular vehicles and operations enables better procurement of assets with a greater lifetime value

Features of Predictive Maintenance by Lumilinks

Scheduling:

After the order is signed, Service Delivery will work within Lumilinks to allocate your Data Scientist and Service Delivery Manager.

Onboarding Call:

The Co-Pilots

Included in the service, Lumilinks will provide a remote Teams (recorded) based meeting for you to escort the Data Scientist (via screen sharing) through your data landscape.

Delivery of predictive vehicle maintenance by Lumilinks contains the following modules:

Snowflake Data Warehouse

Lumilinks experts will set up and manage data pipelines into your own Snowflake environment with best practise applied to security, governance and reliability

Vehicle off road

Predictions will be made against all vehicles in your fleet, with recommended next actions and predicted time to failure for parts. This can be used by engineers and scheduling managers to most effectively carry out the maintenance work. Standard delivery of this module is achieved through Microsoft PowerBI dashboards, however other mechanisms and technologies are readily supported.

Smart Insights

Fleet level insight reporting around SMR history, spend and efficacy presented in Power BI Reports as standard.

Smart Repair

A report on repair agent effectiveness based on historic repairs, spend and recurrence of issues which allows users to choose the best agent to carry out each repair.